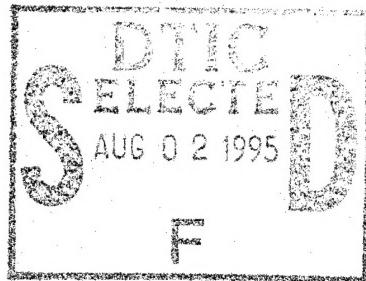


GAO

July 1995

B-1B BOMBER



Evaluation of Air Force Report on B-1B Operational Readiness Assessment



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National Security and
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July 18, 1995

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B-1B Bomber
Evaluation of
Air Force report on
B-1B Operational
Readiness Assessment

Section 132 of the National Defense Authorization Act for Fiscal Year 1994 (Public Law 103-160) required the Air Force to test the operational readiness rate of one B-1B bomber wing, if the wing was provided the planned complement of spare parts, maintenance equipment and manpower, and logistics support equipment. The test—referred to as the B-1B Operational Readiness Assessment (ORA)—was conducted from June 1, 1994, through November 30, 1994. The Air Force issued its report, “B-1B Operational Readiness Assessment Final Report,” to the congressional defense committees on February 28, 1995.

As required by the conference report accompanying the legislation (H.R. 103-357), we are providing our views on the ORA design and implementation and the resulting report.

Background

The B-1B fleet has never achieved its objective of having a 75-percent mission capable rate.¹ During the 2-year period preceding the test, the B-1B mission capable rate averaged about 57 percent. According to the Air Force, a primary reason for the low mission capable rate was the level of funding provided to support the B-1B logistics support system. Concerned about the low mission capable rate, a history of B-1B problems, and the Air Force's plans to spend \$2.4 billion modifying the B-1B to become a conventional bomber, the Congress directed the Air Force to conduct an ORA.

The purpose of the ORA was to determine whether one B-1B wing was capable of achieving and maintaining its planned 75-percent operational readiness rate for a period of 6 months, if provided the full complement of spare parts, maintenance equipment and manpower, and logistic support equipment. If the 75-percent planned operational readiness rate could not be achieved, the ORA was to provide the basis for

- an estimate of the operational readiness rate that could be achieved with the planned level of spares, manpower, and logistics support;
- an estimate of the additional amounts of spares, maintenance manpower, and logistics support and the added costs to achieve the planned operational readiness rate; and
- an enumeration of the specific factors limiting the achievable operational readiness rate, which would be cost-effective to mitigate, and the increase in operational readiness that would result therefrom.

The Air Combat Command, with the assistance of the Air Force Operational Test and Evaluation Center (AFOTEC), developed the test plan. AFOTEC formed a test team that was the Air Force focal point for monitoring and reporting test activities. The unit selected for the ORA was the 28th Bomb Wing, Ellsworth Air Force Base, South Dakota. As required by the legislation, a 2-week segment of the ORA consisted of a remote deployment. The Air Force selected Roswell, New Mexico, as the remote deployment site.

Results in Brief

The ORA test plan was complete and comprehensive. Further, the ORA was conducted in accordance with the test plan.

¹Mission capable means that the bomber can perform at least one of its assigned missions. A more detailed discussion of the Air Force definition of mission capable is included in appendix I.

The ORA demonstrated that, given a full complement of spare parts, equipment, and manpower, the Air Force could achieve and sustain a 75-percent mission capable rate for the B-1B. But, the ORA was not exclusively used to project the cost of sustaining the entire B-1B fleet at that rate. We asked the Air Force to provide an estimate of that cost, but the Air Force declined our request.

At the completion of the ORA, the mission capable rate for the B-1B fleet was about 65 percent. The Air Force believes that the completion of ongoing initiatives in progress and the continued funding for spare parts and repairs will increase the fleet mission capable rate to 72 percent. The Air Force estimates that for an additional \$11.19 million for management actions and reliability and maintainability improvements, the B-1B fleet has the potential to achieve and sustain a 75-percent mission capable rate by 2000. We believe that the \$11.19 million estimate, which was based on various modeling techniques, is optimistic. Neither we nor the Air Force can predict how successful the ongoing or planned initiatives will be. Therefore, the potential cost to achieve and sustain a 75-percent mission capable rate for the B-1B is still not known.

The ORA Was a Credible Exercise

The AFOTEC test plan and the associated detailed test procedures were comprehensive and designed to ensure the credibility of data collected during the ORA. Additionally, AFOTEC personnel adhered to the detailed test procedures that specified their monitoring duties and requirements.

AFOTEC reported that the test unit achieved an 84.3-percent mission capable rate during the test period. The AFOTEC report was a fair presentation of the actual results attained during the test. Further, the report was careful to put the test results in the proper perspective by pointing out that the mission capable rate achieved during the test was a measure of the capability of the B-1B support structure to keep the bomber in a mission capable status, not a measure of the effectiveness of the aircraft to execute assigned missions.

During the 6-month ORA, we visited the 28th Bomb Wing five times, including an on-site presence during the 2-week remote deployment phase. During our visits, we witnessed and documented the wing's activities on the flight line and at the repair and supply facilities. We also accompanied the AFOTEC test team members as they compared their observations with the Air Force maintenance databases used to determine mission capable rates. Their comparisons included reconciling disparities noted between

AFOTEC direct observations and data entered into the Air Force database, which, if left unreconciled, would have resulted in erroneous mission capable rates. Based on our monitoring efforts, we believe that the mission capable rate data accumulated during the ORA, and reflected in the AFOTEC report, are credible.

An unexpected occurrence during the ORA was that the mission capable rates for the nontest units did not decline as the Air Force had anticipated. In that regard, a major assumption of the test plan was that the B-1B fleet would not have all the spare parts needed to achieve the mission capable goal of 75 percent. As a result, the test plan indicated that the mission capable rates of the nontest units would decrease as they sent spare parts to the test unit. This did not happen for a variety of reasons, including a changed force structure, improved repair and distribution of spare parts, improved maintenance practices, and the acquisition of missing defensive avionics systems. These reasons are discussed in appendix II.

Projected Additional Cost to Sustain Fleet at 75 Percent Mission Capable Rate Is Optimistic

As previously stated, one of the test objectives was to provide an estimate of the additional amounts of spare parts, maintenance manpower, and logistics support and the added cost to enable the entire B-1B fleet to sustain a 75-percent mission capable rate. The AFOTEC report concluded that the B-1B fleet has the potential to achieve a 75-percent mission capable rate with an additional \$11.19 million above what is currently requested in the fiscal year 1996 and future budgets.² Our review indicated that the \$11.19 million estimate, which was based on various modeling techniques rather than on ORA data, was optimistic. It is a best case estimate that assumes total success of the planned reliability, maintainability, and management improvements. The ORA was used to verify the need to improve the reliability and maintainability of various B-1B components, rather than provide the basis to project actual costs to the fleet.

According to the Air Force's report, ORA data were not representative of the B-1B fleet. For example, the congressional mandate to conduct the test allowed the test unit to have 100 percent of manpower, spare parts, and support equipment. This level of manning and support provided a robust repair capability that is not historically characteristic of the B-1B fleet or virtually any other Air Force aircraft, according to AFOTEC.

²This cost estimate was prepared by an Air Force cost analysis team and independently verified by AFOTEC.

The \$11.19 million estimate is, therefore, the Air Force's estimate of the most cost-effective way to bring the B-1B fleet to a 75-percent mission capable rate. Table 1 summarizes the factors and related costs that the Air Force projects will yield a 75-percent mission capable rate by 2000.

Table 1: Mission Capable Rate Summary

Factor	Cumulative percentage	Cost
Historical rate	57	None.
Improvements implemented before ORA (+8%) (See app. II.)	65	Already funded. No additional cost.
Initiatives in progress (+<4%) (See ORA report; pp.A-10,11.)	68	Already funded. No additional cost.
Future expenditures for spare parts and repairs (+4%)	72	Continued funding for spares and repairs.
Management actions and unfunded reliability and maintainability improvements (+3%) (See ORA report; p. A-13.)	75	\$11.19 million.

If these initiatives, both funded and unfunded, are not successful, the cost to achieve and sustain the B-1B fleet at a 75-percent mission capable rate will exceed the additional \$11.19 million reported by AFOTEC. Additional spare parts will have to be purchased or repaired more frequently.

In addition, it should be noted that the \$11.19 million estimate represents only the costs associated with management actions and reliability and maintainability improvements that are projected to increase the B-1B mission capable rate from 72 percent to 75 percent. It does not include the cost associated with increasing the B-1B mission capable rate from about 65 percent at the start of the ORA to 72 percent through (1) initiatives that are in progress and funded and (2) future expenditures for spare parts and repairs in support of the flying hour program.

Cost data were not available for the initiatives in progress. Regarding spare parts and repairs, table 2 shows that the Air Force requested \$374.8 million for these items for fiscal years 1996 and 1997.

Table 2: Fiscal Year 1996 Budget Request

	Dollars in millions		
	Fiscal Year		
	1996	1997	Total
Spares/Air Force repair	\$124.9 ^a	\$116.2	\$241.1^a
Contractor repair	56.3	77.4	133.7
Total	\$181.2	\$193.6	\$374.8

^aDoes not include \$165 million for Mobility Readiness Spares Package dedicated for wartime deployment and, as such, does not impact mission capable growth rate.

Funding data for future years spare parts and Air Force repair of parts were not available. According to the President's fiscal year 1996 budget, funding for contractor repair of B-1B parts will continue through fiscal year 2001 at a total cost of about \$122.8 million for fiscal years 1998 through 2001.

In our view, the Air Force's report on the ORA would have been more useful if it had included the estimated cost to sustain the B-1B fleet based on actual ORA test data. The resulting cost estimate would represent the upper limit of the cost of achieving and sustaining a 75-percent mission capable rate for the B-1B fleet based on actual ORA test results.

We met with the Director of Air Force Test and Evaluation on February 9, 1995, before the ORA final report was issued, to discuss our concerns regarding the cost estimate. Based on that discussion, the Director, on February 16, 1995, requested the Air Combat Command to prepare an estimate based on our concerns. By letter dated April 17, 1995, the Director advised us that the \$11.19 million "cost effective" estimate included in the Air Force's ORA report was the appropriate response to the congressional legislation directing the ORA.

The Air Force is projecting that the B-1B fleet will reach a 75-percent mission capable rate by 2000 by virtue of numerous on-going and future reliability, maintainability, and management initiatives. In the meantime, the Congress is being requested to fund the B-1B Conventional Mission Upgrade Program³—a program estimated to cost \$2.4 billion and to continue through 2007. By 2000, the Air Force plans to have spent almost \$1.4 billion on the program. Without a range of estimates, including an estimate based on actual ORA experience as described above, the Congress

³This program is intended to enhance the B-1B conventional capability by adding precision guided munitions, upgrading the electronic countermeasures system, and adding an antijam radio. The Air Force is requesting \$196.6 million for the program in fiscal year 1996.

will not have the best information to make more informed decisions regarding future funding for upgrading the B-1B.

Matters for Congressional Consideration

Before making its funding decisions on the Conventional Mission Upgrade Program, the Congress may wish to consider requiring the Air Force to project the actual costs of the ORA to the B-1B fleet. This projection would provide the Congress with more comprehensive data on the potential cost to bring the B-1B fleet to the planned 75-percent mission capable rate.

Agency Comments and Our Evaluation

In commenting on a draft of this report, the Department of Defense concurred with our findings. It did not concur, however, with our suggestion that the Congress require the Air Force to project the actual costs of the ORA to the B-1B fleet.

In its comments, the Department stated that, because the ORA actually achieved a mission capable rate of 84.3 percent, projecting the actual costs of the ORA as the way to improve the B-1B fleet mission capable rate to 75 percent would likely overstate the requirement. As we pointed out in our report and the Department recognized in its comments, the \$11.19 million estimate the Air Force provided to the Congress assumed that (1) management emphasis on mission capable rates would continue, (2) planned improvements for increasing the mission capable rates would be maintained, (3) funding levels for spares would be sustained at projected levels, and (4) identified reliability and maintainability and process improvements would be incorporated.

In our view, the ORA provided the Air Force a unique opportunity to project the cost to increase the B-1B mission capable rate based on actual data, rather than on success oriented assumptions. Therefore, we continue to believe that providing a range of cost estimates based more directly on ORA results would be useful to the Congress.

The Department's comments are included in their entirety in appendix III.

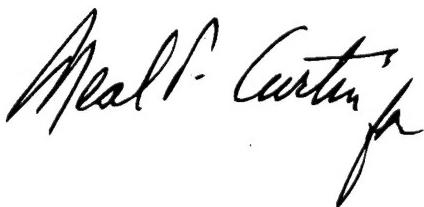
Scope and Methodology

We performed our work at headquarters, U.S. Air Force, Washington, D.C.; Air Combat Command, Langley Air Force Base, Virginia; the 28th Bomb Wing, Ellsworth Air Force Base, South Dakota; the 7th Wing, Dyess Air Force Base, Texas; the 384 Bomb Group, McConnell Air Force Base, Kansas; Roswell Air Industrial Center, New Mexico; and the B-1B System

Program Office, Wright-Patterson Air Force Base, Ohio. At these locations, we interviewed responsible agency personnel and reviewed applicable policies, procedures, and documents. We conducted our review between February 1994 and April 1995 in accordance with generally accepted government auditing standards.

We are sending copies of this report to other appropriate congressional committees; the Secretaries of Defense and the Air Force; and the Director, Office of Management and Budget. We will also provide copies to other interested parties upon request.

If you have any questions concerning this report, please call me on (202) 512-4841. The major contributors to this report are listed in appendix IV.

A handwritten signature in black ink, appearing to read "Louis J. Rodrigues".

Louis J. Rodrigues
Director, Systems Development
and Production Issues

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Abbreviations

AFOTEC	Air Force Operational Test and Evaluation Center
FMC	fully mission capable
MC	mission capable
MESL	Mission-Essential Subsystem List
NMC	not mission capable
ORA	Operational Readiness Assessment
PMC	partially mission capable

Mission Capable Rate

Mission capable is defined by Air Force Instructions 10-602 and 21-103 as an aircraft's capability to perform at least one of its assigned peacetime or wartime missions. As such, the mission capable rate is the measure of the ability of the B-1B support structure to keep the bomber in a mission capable status. Instruction 10-602 defines fully mission capable (FMC), partially mission capable (PMC), and not mission capable (NMC), as follows:

- A FMC aircraft is one that can perform all assigned peacetime and wartime missions.
- A PMC aircraft is one that can perform at least one, but not all, of its missions.
- A NMC aircraft is one that cannot perform any of its assigned missions.

A mission capable rate is further defined as the sum of the FMC and PMC rates.

An important factor in determining the rate is the Mission-Essential Subsystem List (MESL). Each subsystem on the MESL serves as a required element of either a FMC or PMC aircraft. The B-1B MESL contains 54 subsystems that must be operational for the bomber to be FMC.

The B-1B can do conventional bombing missions when in a PMC status. At present, and during the B-1B Operational Readiness Assessment (ORA), all of the B-1B bombers fly missions in only a PMC status. The reason for this is that several of the 54 systems and subsystems listed in the MESL either do not work as planned or, as in the case of the band 6 transmitter discussed in the following table, are not permitted to be turned on for safety reasons. The nonoperational systems precluding the B-1B from being FMC, together with the current status of those systems, are listed in table I.1.

Appendix I
Mission Capable Rate

Table I.1: Status of Nonoperational Systems and Subsystems on the MESL

Nonoperational system	Problem	Planned corrective action
Ice and Rain Protection (engine inlet area)	System melts ice that can refreeze, break off, and damage the engine. Also, the system does not provide ice protection for entire engine inlet area.	This system will be deleted from the MESL because aircrews do not fly in icing conditions or they leave icing areas as soon as possible. ^a
Window/Windshield Anti-Ice Defog	Maintenance personnel have accidentally turned on the system while on the ground, which can cause the windshield to overheat and crack.	This system will be deleted from the MESL because bleeding air from the engine is an alternate method that can be used to keep the windshield clear. ^a
Electronic Warfare ECM Band 4	Band 4 aft sector transmitter interferes with the Tail Warning Function system.	Band 4 will be deleted from the MESL because there are no lethal threat radars in this band. ^a
Electronic Warfare ECM Band 6	Using the electronic countermeasures in Band 6 has the potential to heat the radar absorbing material around the antenna, presenting a fire hazard.	A corrective modification was tested in late April 1995, and the results are being analyzed.

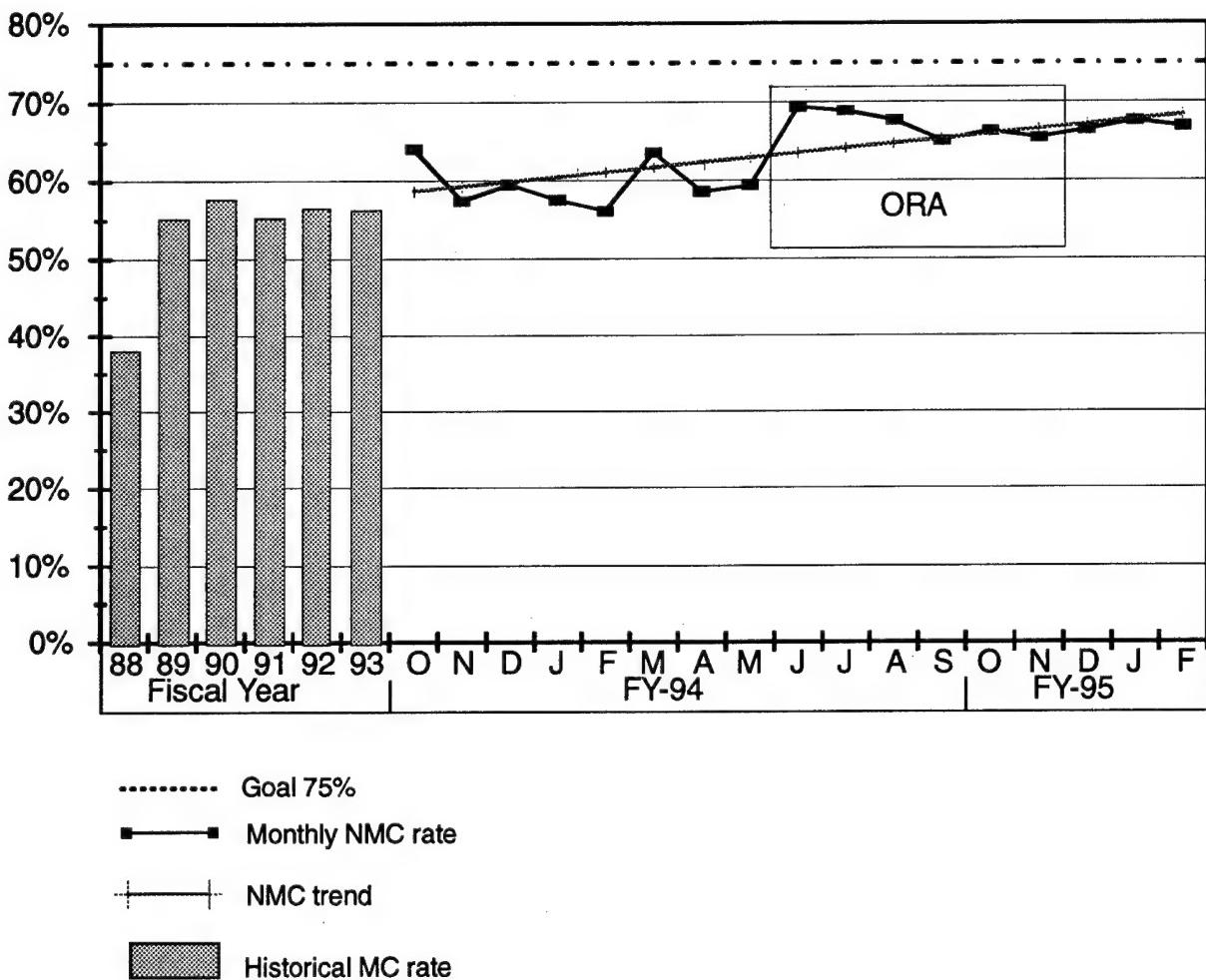
^aThe B-1B MESL is being updated to reflect these changes.

Improvements That Increased B-1B Mission Capable Rates Prior to ORA

The mission capable (MC) rate for the B-1B fleet increased about 8 percent from its historical average of about 57 percent to about 65 percent by the end of the ORA (see fig.II.1). The Air Force emphasized the conventional role of the B-1B in the 1992 Bomber Roadmap after the stand-down of nuclear alert aircraft in 1991. As the B-1B transitioned from a role of nuclear deterrence to conventional missions, MC rates became an important indicator of the B-1B's ability to conduct repetitive conventional sorties. As a result, the Air Force took several initiatives to improve the B-1B's support posture and MC rate. The 8-percent improvement is attributable primarily to a changed force structure, improved repair and distribution of spare parts, improved maintenance practices, and the acquisition of missing defensive avionics systems.

Appendix II
**Improvements That Increased B-1b Mission
Capable Rates Prior to ORA**

Figure II.1: B-1B Fleet MC Rates



Appendix II
Improvements That Increased B-1b Mission
Capable Rates Prior to ORA

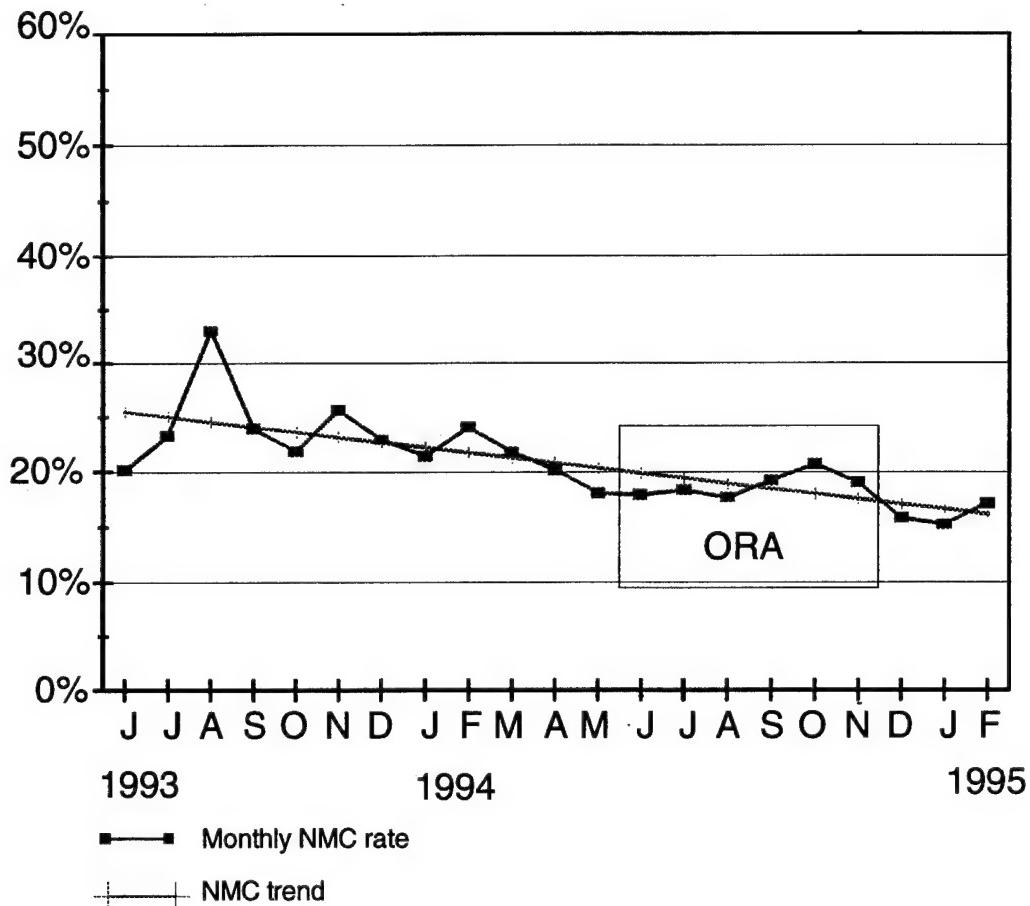
With the transfer, the B-1B support structure, including spare parts, was distributed to the two remaining main operating bases. The concentration of aircraft and repair facilities at Dyess and Ellsworth Air Force Bases resulted in improved support capabilities, which improved MC rates.

**Spare Parts Repair
and Distribution
Improvements**

Spare parts availability improved because of increased repair capability, reduced reliance on contractor repair, reduced repair cycle times, increased spare parts management oversight, and implementation of a new computer system to oversee supply distribution and repair of parts. These initiatives reduced the total NMC for supply rate, as shown in figure II.2.

Appendix II
Improvements That Increased B-1b Mission
Capable Rates Prior to ORA

Figure II.2: B-1B Total NMC Rate for Supply



The logistics concept for the B-1B is to have contractors do repairs until the repair capability can be taken over by the Air Force. Due to funding shortfalls in 1987 and 1988, the Air Force deferred buying some B-1B logistics support equipment, which increased reliance on contractor repair. As of September 1993, the B-1B fleet had a contractor repair backlog of about 3,800 assets with an estimated repair cost of about \$31 million. The deferred logistics support items, however, are now funded, and the Air Force's repair capability for the B-1B is increasing. As of March 1995, its repair capability was 86 percent of repairable items, with a 100-percent capability projected by the end of fiscal year 1997.

Because of increased Air Force repair capability and repair funding, the repair backlog was eliminated by May 1994.

In addition, the repairs are done faster because of process improvements and increased reliability and availability of repair equipment. For example, the average repair time has been reduced from 21 to 12 days. Specific initiatives included:

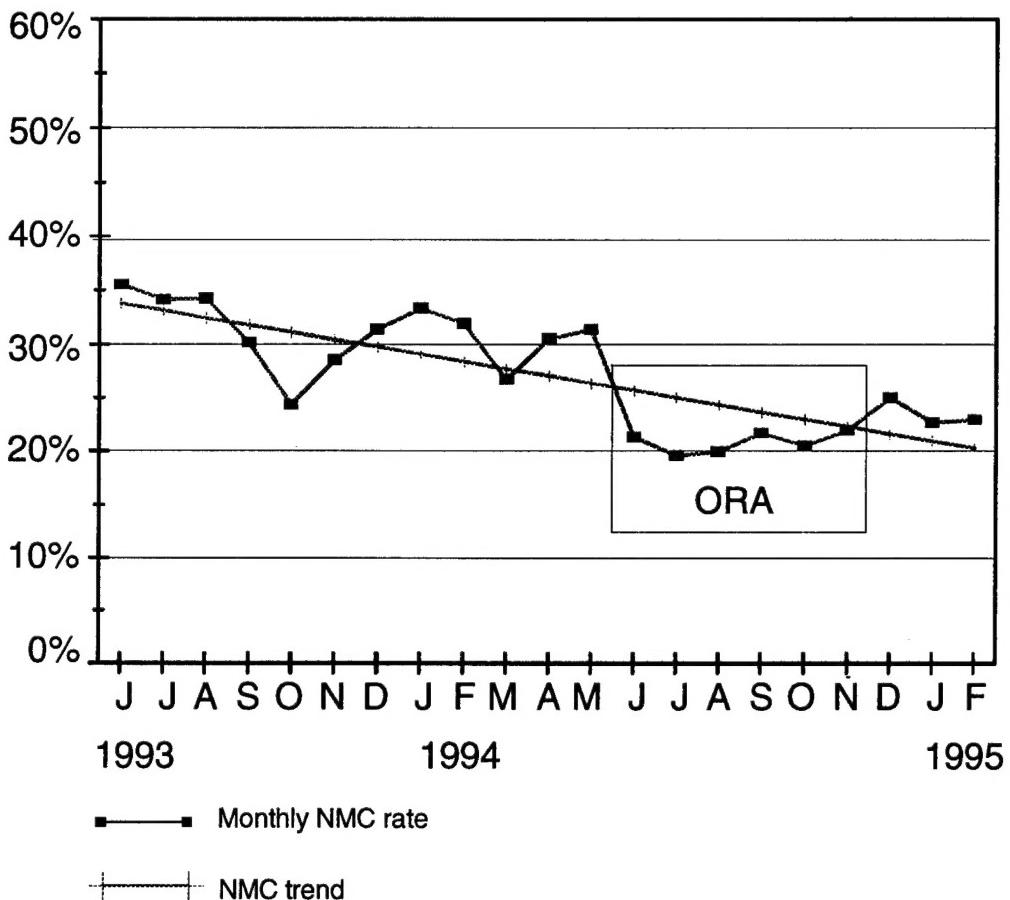
- The Oklahoma City Air Logistics Center B-1B avionics shop increased its workforce from 15 to 36 people.
- Use of express package carriers, such as Federal Express reduced the time aircraft await parts.
- The Air Combat Command established the B-1B Customer Support Cell in July 1993 with nine staff members to monitor critical B-1B parts levels, distribute spare parts between bases, and direct item managers to provide support where it is most needed.
- In January 1994, the Air Force adopted a new system at bases and depots to prioritize repairs and distribute B-1B spare parts, based on impact on MC rates. Previously, the oldest requisitions were satisfied first, regardless of their impact on MC rates.

Improved Maintenance Practices

As B-1B units gained experience in performing periodic inspections and maintenance (known as phase maintenance), the Air Force determined that the interval between phase maintenance could be increased from 200 flying hours to 300 flying hours. This change reduced the number of aircraft NMC for maintenance, as shown in figure II.3.

Appendix II
Improvements That Increased B-1B Mission
Capable Rates Prior to ORA

Figure II.3: B-1B Total NMC Rate for Maintenance



Acquisition of Defensive Avionics Systems

As a result of problems encountered during the development and production of the defensive avionics system, a number of B-1B bombers did not have a defensive avionics system. Because this is a mission critical system, these bombers could not be counted as mission capable. The missing systems have been acquired, and the last system was installed in April 1994. Installation of the defensive avionics system enabled these aircraft to achieve a PMC status, thereby having a positive effect on the fleet's MC rates.

Comments From the Department of Defense



OFFICE OF THE UNDER SECRETARY OF DEFENSE

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June 12, 1995

Mr. Louis J. Rodrigues
Director, Systems Development and
Production Issues
National Security and
International Affairs Division
U.S. General Accounting Office
Washington, D.C. 20548

Dear Mr. Rodrigues:

This is the Department of Defense (DoD) response to the General Accounting Office (GAO) draft report, "B-1B BOMBER: Evaluation of Air Force Report on B-1B Operational Readiness Assessment," dated May 24, 1995 (GAO Code 707059), OSD Case 9945. The DoD concurs with the overall report message that the B-1B Operational Readiness Assessment (ORA) mission capable (MC) rate data are credible; however, the DoD does not concur with the GAO suggestion contained in the matter for congressional consideration. The Department compliments the GAO field representatives for their active, professional involvement during the conduct of the ORA.

The GAO suggested that the Congress may wish to consider requiring the Air Force to project the actual costs of the ORA to the B-1B fleet. The DoD believes that the Congress requested the Air Force to estimate the added costs of increasing the B-1B MC rate using the most cost-effective method. Because the ORA actually achieved a MC rate of 84.3%, projecting the actual costs of the ORA as the way to improve the B-1B fleet MC rate would likely overstate the requirement, and would fail to take advantage of other reasonable methods of improving MC rates. For example, other ways of improving aircraft MC rate would include management initiatives, process improvements, and hardware improvements.

On February 28, 1995, the Air Force provided the Congress a summary of the ORA results in the report, "B-1B Operational Readiness Assessment Final Report," dated February 1995. The Air Force estimated the added costs associated with achieving a MC rate of 75% rather than the actual 84.3% MC rate achieved during the ORA. The estimate also reflects prior experience with the B-1B weapon system and lessons learned during the ORA. The estimate for added costs of increasing the B-1B MC rate to 75% assumes that (1) management emphasis on MC rates is continued, (2) planned improvements for increasing the MC rate are maintained, (3) funding level for spares is sustained at projected levels, and (4) identified reliability and maintainability and process improvements are incorporated.



Appendix III
Comments From the Department of Defense

As pointed out by the GAO, the Congress will likely consider the results of the highly successful B-1B ORA as it considers additional funding for the B-1B Conventional Mission Upgrade Program. Also notable, on May 3, 1995, the DoD provided the congressional defense committees with detailed results of the FY 1995 Heavy Bomber Force Study that specifically addressed the planned conventional upgrades to the B-1B and found those upgrades to be cost-effective. Based upon actual ORA experience and the FY 1995 Heavy Bomber Force Study, the DoD believes that the B-1B, when modified with the planned upgrades, will become the mainstay heavy bomber for conducting conventional warfare.



George R. Schneiter
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